ABSTRACT OF THE DISCLOSURE

This invention relates to a system for estimating the position, <u>velocity</u> ~~speed~~ and orientation of a vehicle, by determining the components of two noncollinear constant unit vectors $\hat{g}_b, \hat{e}_b$ according to vehicle body axes; and determining the components of the noncollinear constant unit vectors $\vec{g}_I, \vec{e}_I$ according to Earth's axes. The system further determines the three components of angular velocity $\hat{\omega}_b$ of the vehicle in body axes; corrects the angular velocity $\hat{\omega}_b$ with a correction u_ω and obtains a corrected angular velocity $\hat{\omega}_b = \hat{\omega}_b + u_\omega$; a control module implementing a control law to calculate the correction u_ω, where the control law is:

$$u_\omega = \sigma(\hat{g}_b \times \hat{g}_b + \hat{e}_b \times \hat{e}_b) \qquad [1]$$

where σ is a positive scalar,

- such that upon using the corrected angular velocity $\hat{\omega}_b = \hat{\omega}_b + u_\omega$ as input to a module for integrating the kinematic equations, the latter are stable in the ISS sense and the error in the estimation of the direction cosine matrix $\hat{B}$ and of the Euler angles $\hat{\Phi}$ is bounded.